

ISC Class XII — Mathematics

COMPLETE FORMULA SHEET | BOARD EXAM 2026

65 Section A Marks

15 Section B or C

80 Theory Total

20 Project Work

9 Mar Exam Date

Section A — Compulsory

65 Marks

1 Relations & Functions

10 M

Reflexive

$$aRa \quad \forall a \in A$$

Symmetric

$$aRb \Rightarrow bRa$$

Transitive

$$aRb \text{ and } bRc \Rightarrow aRc$$

Equivalence

Reflexive + Symmetric + Transitive

One-One (Injective)

$$f(a) = f(b) \Rightarrow a = b$$

Onto (Surjective)

Range = Codomain

Bijjective = Invertible

One-One + Onto

DOMAIN & RANGE (PRINCIPAL VALUES)

$\sin^{-1} x$	Domain $[-1, 1]$ Range $[-\pi/2, \pi/2]$
$\cos^{-1} x$	Domain $[-1, 1]$ Range $[0, \pi]$
$\tan^{-1} x$	Domain $\mathbb{R}$ Range $(-\pi/2, \pi/2)$
$\cot^{-1} x$	Domain $\mathbb{R}$ Range $(0, \pi)$
$\sec^{-1} x$	Domain $ x \geq 1$ Range $[0, \pi] - \{\pi/2\}$
$\operatorname{cosec}^{-1} x$	Domain $ x \geq 1$ Range $[-\pi/2, \pi/2] - \{0\}$

COMPLEMENTARY PAIRS

$\sin^{-1} x + \cos^{-1} x$	$= \frac{\pi}{2}$
$\tan^{-1} x + \cot^{-1} x$	$= \frac{\pi}{2}$
$\sec^{-1} x + \operatorname{cosec}^{-1} x$	$= \frac{\pi}{2}$
$\sin^{-1}(-x)$	$= -\sin^{-1} x$
$\cos^{-1}(-x)$	$= \pi - \cos^{-1} x$
$\tan^{-1}(-x)$	$= -\tan^{-1} x$

RECIPROCAL IDENTITIES

$\sin^{-1}\left(\frac{1}{x}\right)$	$= \operatorname{cosec}^{-1} x$
$\cos^{-1}\left(\frac{1}{x}\right)$	$= \sec^{-1} x$
$\tan^{-1}\left(\frac{1}{x}\right), x > 0$	$= \cot^{-1} x$
$\tan^{-1}\left(\frac{1}{x}\right), x < 0$	$= -\pi + \cot^{-1} x$

ADDITION & DOUBLE ANGLE FORMULAE

$\tan^{-1} x + \tan^{-1} y$	$= \tan^{-1} \frac{x+y}{1-xy} \quad (xy < 1)$
$\tan^{-1} x - \tan^{-1} y$	$= \tan^{-1} \frac{x-y}{1+xy}$
$\sin^{-1} x + \sin^{-1} y$	$= \sin^{-1} (x\sqrt{1-y^2} + y\sqrt{1-x^2})$
$\cos^{-1} x + \cos^{-1} y$	$= \cos^{-1} (xy - \sqrt{1-x^2}\sqrt{1-y^2})$
$2 \sin^{-1} x$	$= \sin^{-1} (2x\sqrt{1-x^2})$
$2 \cos^{-1} x$	$= \cos^{-1} (2x^2 - 1)$
$2 \tan^{-1} x$	$= \tan^{-1} \frac{2x}{1-x^2} = \sin^{-1} \frac{2x}{1+x^2} = \cos^{-1} \frac{1-x^2}{1+x^2}$
$3 \tan^{-1} x$	$= \tan^{-1} \frac{3x-x^3}{1-3x^2}$

3 Matrices

10 M

Symmetric	$A^T = A$
Skew-Symmetric	$A^T = -A$ (diagonal = 0)
Any Square Matrix	$A = \frac{A + A^T}{2} + \frac{A - A^T}{2}$
Inverse of A	$A^{-1} = \frac{\text{adj}(A)}{ A }$
2x2 Inverse	If $A = \begin{bmatrix} a & b \\ c & d \end{bmatrix} \Rightarrow A^{-1} = \frac{1}{ A } \begin{bmatrix} d & -b \\ -c & a \end{bmatrix}$
$(AB)^{-1}$	$= B^{-1}A^{-1}$
$(A^T)^{-1}$	$= (A^{-1})^T$
$A \cdot \text{adj}(A)$	$= A \cdot I$
Martin's Rule $AX = B$	$X = A^{-1}B$

4 Determinants

Area of Δ	$\frac{1}{2} x_1(y_2 - y_3) + x_2(y_3 - y_1) + x_3(y_1 - y_2) $
Collinear Points	$\Delta = 0$
$\text{adj } A$	$= A ^{n-1}$ (n = order)
A^{-1}	$= \frac{1}{ A }$
AB	$= A \cdot B $
kA (order n)	$= k^n A $
Singular Matrix	$ A = 0$ (no inverse)

Two equal rows/cols $\Rightarrow \det = 0$ | Interchange two rows $\Rightarrow$ sign changes

Calculus — Highest Priority

32 Marks

5 Continuity, Differentiability & Differentiation

Continuity at $x = a$: $LHL = RHL = f(a)$

STANDARD DERIVATIVES

$\frac{d}{dx} (x^n)$	$= n x^{n-1}$
$\frac{d}{dx} (e^x)$	$= e^x$
$\frac{d}{dx} (a^x)$	$= a^x \cdot \log a$
$\frac{d}{dx} (\log x)$	$= \frac{1}{x}$
$\frac{d}{dx} (\sin x)$	$= \cos x$
$\frac{d}{dx} (\cos x)$	$= -\sin x$
$\frac{d}{dx} (\tan x)$	$= \sec^2 x$
$\frac{d}{dx} (\cot x)$	$= -\operatorname{cosec}^2 x$
$\frac{d}{dx} (\sec x)$	$= \sec x \cdot \tan x$
$\frac{d}{dx} (\operatorname{cosec} x)$	$= -\operatorname{cosec} x \cdot \cot x$

INVERSE TRIG DERIVATIVES

$\frac{d}{dx} (\sin^{-1} x)$	$= \frac{1}{\sqrt{1-x^2}}$
$\frac{d}{dx} (\cos^{-1} x)$	$= -\frac{1}{\sqrt{1-x^2}}$
$\frac{d}{dx} (\tan^{-1} x)$	$= \frac{1}{1+x^2}$
$\frac{d}{dx} (\cot^{-1} x)$	$= -\frac{1}{1+x^2}$
$\frac{d}{dx} (\sec^{-1} x)$	$= \frac{1}{x\sqrt{x^2-1}}$
$\frac{d}{dx} (\operatorname{cosec}^{-1} x)$	$= -\frac{1}{x\sqrt{x^2-1}}$

RULES

Chain Rule	$\frac{dy}{dx} = \frac{dy}{du} \cdot \frac{du}{dx}$
Product Rule	$\frac{d}{dx} (uv) = u \cdot v' + v \cdot u'$
Quotient Rule	$\frac{v \cdot u' - u \cdot v'}{v^2}$
Parametric	$\frac{dy}{dx} = \frac{dy/dt}{dx/dt}$
Log Diff ($y = x^x$)	Take log both sides, then differentiate
2nd Order	$\frac{d^2 y}{dx^2} = \frac{d}{dx} \left(\frac{dy}{dx} \right)$

6 Applications of Derivatives (AOD) — Most Scoring!

TANGENT & NORMAL

Slope of tangent at (x_1, y_1)	$m = \left[\frac{dy}{dx} \right]_{(x_1, y_1)}$
Equation of Tangent	$y - y_1 = m(x - x_1)$
Equation of Normal	$y - y_1 = -\frac{1}{m}(x - x_1)$
Tangent $\parallel$ x-axis	$\frac{dy}{dx} = 0$
Tangent $\parallel$ y-axis	$\frac{dx}{dy} = 0$
Rate of Change	$\frac{dy}{dt} = \frac{dy}{dx} \cdot \frac{dx}{dt}$

MAXIMA & MINIMA

Increasing Function	$f'(x) > 0$
Decreasing Function	$f'(x) < 0$
Critical Points	$f'(x) = 0$
Local Max (1st DT)	f' changes $+$ $\rightarrow$ $-$
Local Min (1st DT)	f' changes $-$ $\rightarrow$ $+$
Max (2nd DT)	$f'(x)=0$ and $f''(x) < 0$
Min (2nd DT)	$f'(x)=0$ and $f''(x) > 0$
Point of Inflexion	$f''(x) = 0$ (neither max nor min)

7 Indefinite Integrals

STANDARD FORMS

$\int x^n dx$	$\frac{x^{n+1}}{n+1} + C \quad (n \neq -1)$
$\int \frac{1}{x} dx$	$= \log x + C$
$\int e^x dx$	$= e^x + C$
$\int a^x dx$	$= \frac{a^x}{\log a} + C$
$\int \sin x dx$	$= -\cos x + C$
$\int \cos x dx$	$= \sin x + C$
$\int \tan x dx$	$= \log \sec x + C$
$\int \cot x dx$	$= \log \sin x + C$
$\int \sec x dx$	$= \log \sec x + \tan x + C$
$\int \operatorname{cosec} x dx$	$= \log \operatorname{cosec} x - \cot x + C$
$\int \sec^2 x dx$	$= \tan x + C$
$\int \operatorname{cosec}^2 x dx$	$= -\cot x + C$

SPECIAL INTEGRALS

$\int \frac{dx}{x^2 - a^2}$	$\frac{1}{2a} \log \left \frac{x-a}{x+a} \right + C$
$\int \frac{dx}{a^2 - x^2}$	$\frac{1}{2a} \log \left \frac{a+x}{a-x} \right + C$
$\int \frac{dx}{x^2 + a^2}$	$\frac{1}{a} \tan^{-1} \frac{x}{a} + C$
$\int \frac{dx}{\sqrt{x^2 - a^2}}$	$\log x + \sqrt{x^2 - a^2} + C$
$\int \frac{dx}{\sqrt{x^2 + a^2}}$	$\log x + \sqrt{x^2 + a^2} + C$
$\int \frac{dx}{\sqrt{a^2 - x^2}}$	$\sin^{-1} \frac{x}{a} + C$
$\int \sqrt{a^2 - x^2} dx$	$\frac{x}{2} \sqrt{a^2 - x^2} + \frac{a^2}{2} \sin^{-1} \frac{x}{a} + C$
$\int \sqrt{x^2 + a^2} dx$	$\frac{x}{2} \sqrt{x^2 + a^2} + \frac{a^2}{2} \log x + \sqrt{x^2 + a^2} + C$
$\int \sqrt{x^2 - a^2} dx$	$\frac{x}{2} \sqrt{x^2 - a^2} - \frac{a^2}{2} \log x + \sqrt{x^2 - a^2} + C$

BY PARTS & PARTIAL FRACTIONS

$$\int u \cdot v dx = u \int v dx - \int [u' \cdot v dx] dx$$

ILATE: Inverse trig → Log → Algebraic → Trig → Exponential

$\frac{px+q}{(x-a)(x-b)}$	$\frac{A}{x-a} + \frac{B}{x-b}$
$\frac{px+q}{(x-a)^2}$	$\frac{A}{x-a} + \frac{B}{(x-a)^2}$
$\frac{px^2+qx+r}{(x-a)(x^2+bx+c)}$	$\frac{A}{x-a} + \frac{Bx+C}{x^2+bx+c}$

INVERSE TRIG INTEGRALS

$\int \frac{1}{\sqrt{1-x^2}} dx$	$= \sin^{-1} x + C$
$\int \frac{1}{1+x^2} dx$	$= \tan^{-1} x + C$
$\int \sec x \cdot \tan x dx$	$= \sec x + C$
$\int \operatorname{cosec} x \cdot \cot x dx$	$= -\operatorname{cosec} x + C$

8 Definite Integrals — All 9 Properties (Always Asked!)

P1: Dummy Variable	$\int_a^b f(x) dx = \int_a^b f(t) dt$
P2: Reverse Limits	$\int_a^b f(x) dx = - \int_b^a f(x) dx$
P3: Splitting	$\int_a^b f(x) dx = \int_a^c f(x) dx + \int_c^b f(x) dx$
P4: King Rule	$\int_a^b f(x) dx = \int_a^b f(a+b-x) dx$
P5: King Rule (0 to a)	$\int_0^a f(x) dx = \int_0^a f(a-x) dx$
P6: 0 to 2a (Case I)	$= 2 \int_0^a f(x) dx \quad \text{if } f(2a-x) = f(x)$
P6: 0 to 2a (Case II)	$= 0 \quad \text{if } f(2a-x) = -f(x)$
P7: Even Function	$\int_{-a}^a f(x) dx = 2 \int_0^a f(x) dx$
P7: Odd Function	$\int_{-a}^a f(x) dx = 0$
Even if	$f(-x) = f(x) \quad \quad \text{Odd if } f(-x) = -f(x)$

9 Differential Equations

Order	Highest derivative present
Degree	Power of highest derivative (after clearing fractions/radicals)
Variable Separable	$f(y) dy = g(x) dx \rightarrow$ integrate both sides
Homogeneous DE	Put $y = vx \Rightarrow \frac{dy}{dx} = v + x \frac{dv}{dx}$
Linear DE: $\frac{dy}{dx} + Py = Q$	IF = $e^{\int P dx} \quad \quad \text{Solution: } y \cdot (\text{IF}) = \int Q \cdot (\text{IF}) dx + C$
Linear DE: $\frac{dx}{dy} + Px = Q$	IF = $e^{\int P dy} \quad \quad \text{Solution: } x \cdot (\text{IF}) = \int Q \cdot (\text{IF}) dy + C$

Probability — Master Bayes' Theorem

13 Marks

10 Probability

CORE LAWS

Addition Theorem	$P(A \cup B) = P(A) + P(B) - P(A \cap B)$
Conditional Probability	$P(A B) = \frac{P(A \cap B)}{P(B)}$
Multiplication Theorem	$P(A \cap B) = P(A) \cdot P(B A)$
Independent Events	$P(A \cap B) = P(A) \cdot P(B)$
Total Probability	$P(B) = \sum P(A_i) \cdot P(B A_i)$
Bayes' Theorem ★	$P(A_i B) = \frac{P(A_i) \cdot P(B A_i)}{\sum P(A_n) \cdot P(B A_n)}$
Complement	$P(A') = 1 - P(A)$

PROBABILITY DISTRIBUTION

Condition	$\sum P(x_i) = 1$ (always verify first!)
Mean $E[X] = \mu$	$= \sum x_i \cdot P(x_i)$
$E[X^2]$	$= \sum x_i^2 \cdot P(x_i)$
Variance	$= E[X^2] - (E[X])^2$
SD	$= \sqrt{\text{Variance}}$
Binomial $P(X=r)$	$= {}^nC_r \cdot p^r \cdot q^{(n-r)}$ ($q = 1-p$)
Binomial Mean	$= np$
Binomial Variance	$= npq$

Section B — Vectors, 3D Geometry & AOI

15 Marks

11 Vectors

5 M

Magnitude $\vec{a}$	$= \sqrt{a_1^2 + a_2^2 + a_3^2}$
Unit Vector $\hat{a}$	$= \frac{\vec{a}}{ \vec{a} }$
Dot Product $\vec{a} \cdot \vec{b}$	$= \vec{a} \vec{b} \cos \theta = a_1b_1 + a_2b_2 + a_3b_3$
$\cos \theta$	$= \frac{\vec{a} \cdot \vec{b}}{ \vec{a} \vec{b} }$
Perpendicular $\Leftrightarrow$	$\vec{a} \cdot \vec{b} = 0$
Parallel $\Leftrightarrow$	$\vec{a} \times \vec{b} = \vec{0}$
$\hat{i} \cdot \hat{i} = \hat{j} \cdot \hat{j} = \hat{k} \cdot \hat{k}$	$= 1 \quad \quad \hat{i} \cdot \hat{j} = \hat{j} \cdot \hat{k} = \hat{k} \cdot \hat{i} = 0$
Cross Product $\vec{a} \times \vec{b}$	$= \vec{a} \vec{b} \sin \theta$
$\hat{i} \times \hat{j} = \hat{k}$	$\hat{j} \times \hat{k} = \hat{i} \quad \quad \hat{k} \times \hat{i} = \hat{j}$
$\hat{i} \times \hat{i} = \hat{j} \times \hat{j} = \hat{k} \times \hat{k}$	$= \vec{0}$
Area of Parallelogram	$= \vec{a} \times \vec{b} $
Area of Triangle	$= \frac{1}{2} \vec{a} \times \vec{b} $
Section Formula (int.)	$\frac{m \cdot \vec{b} + n \cdot \vec{a}}{m + n}$
Midpoint Formula	$\frac{\vec{a} + \vec{b}}{2}$

12 Three-Dimensional Geometry

6 M

DIRECTION COSINES & LINES

DC relation	$l^2 + m^2 + n^2 = 1$
DC from DR (a,b,c)	$l = \frac{a}{\sqrt{a^2+b^2+c^2}}$ similarly m,n
Angle between lines (DC)	$\cos\theta = l_1l_2 + m_1m_2 + n_1n_2$
Angle between lines (DR)	$\cos\theta = \frac{ a_1a_2+b_1b_2+c_1c_2 }{ \vec{d}_1 \vec{d}_2 }$
Perpendicular lines	$a_1a_2 + b_1b_2 + c_1c_2 = 0$
Parallel lines	$\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$
Line (Cartesian)	$\frac{x-x_1}{a} = \frac{y-y_1}{b} = \frac{z-z_1}{c}$
Line (Vector)	$\vec{r} = \vec{a} + \lambda\vec{b}$
Shortest Dist (skew)	$\frac{ (\vec{a}_2 - \vec{a}_1) \cdot (\vec{b}_1 \times \vec{b}_2) }{ \vec{b}_1 \times \vec{b}_2 }$
Dist (parallel lines)	$\frac{ (\vec{a}_2 - \vec{a}_1) \times \vec{b} }{ \vec{b} }$

PLANES

Plane (Vector normal)	$\vec{r} \cdot \vec{n} = d$
Plane (Cartesian)	$ax + by + cz = d$
Plane (Intercept form)	$\frac{x}{a} + \frac{y}{b} + \frac{z}{c} = 1$
Dist: point to plane	$\frac{ ax_1+by_1+cz_1-d }{\sqrt{a^2+b^2+c^2}}$
Angle between 2 planes	$\cos\theta = \frac{ \vec{n}_1 \cdot \vec{n}_2 }{ \vec{n}_1 \vec{n}_2 }$
Angle: line & plane	$\sin\theta = \frac{ \vec{b} \cdot \vec{n} }{ \vec{b} \vec{n} }$
Planes perpendicular $\iff$	$\vec{n}_1 \cdot \vec{n}_2 = 0$
Planes parallel $\iff$	$\vec{n}_1 = \lambda\vec{n}_2$ (same normal direction)

13 Application of Integrals (AOI)

4 M

Area under curve (x-axis)	$= \left \int_a^b f(x) dx \right $
Area between two curves	$= \int_a^b [f(x) - g(x)] dx$ where $f(x) \geq g(x)$
Area w.r.t y-axis	$= \left \int_c^d f(y) dy \right $
Circle $x^2+y^2=r^2$	Area = πr^2
Ellipse $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$	Area = πab
Parabola $y^2=4ax$	Opens right; vertex at origin; axis is x-axis

Always draw the rough sketch FIRST. Check whether area is above or below x-axis before integrating!

Section C — Linear Regression & LPP

15 Marks

14 Linear Regression

6 M

Reg. line y on x	$y - \bar{y} = b_{yx}(x - \bar{x})$
Reg. line x on y	$x - \bar{x} = b_{xy}(y - \bar{y})$
b_{yx}	$= r \cdot \frac{\sigma_y}{\sigma_x} = \frac{\sum (x_i - \bar{x})(y_i - \bar{y})}{\sum (x_i - \bar{x})^2}$
b_{xy}	$= r \cdot \frac{\sigma_x}{\sigma_y}$
Correlation r	$= \sqrt{b_{yx} \times b_{xy}}$
Property	$0 \leq b_{yx} \times b_{xy} \leq 1$
Lines meet at	$(\bar{x}, \bar{y})$ always
$r = 0$	Lines are perpendicular
$r = \pm 1$	Lines coincide

15 Linear Programming (LPP)

4 M

Objective Function	$Z = ax + by$ (maximise or minimise)
Constraints	Linear inequalities in x and y
Non-negativity	$x \geq 0, y \geq 0$ (always include)
Feasible Region	Region satisfying ALL constraints
Corner Point Method	Evaluate Z at every corner point
Optimal Z	Maximum or minimum among all corner values
Unbounded region	Check if solution exists beyond feasible region

Steps: Formulate → Graph constraints → Identify feasible region → Find corners → Evaluate Z

🕒 Exam Day Priority Guide

32

Calculus Marks

AOD + Integrals + DE + Continuity

13

Probability Marks

Bayes' Theorem always asked!

15

Section B Marks

Vectors + 3D + AOI

10

Algebra Marks

Matrices + Determinants

You've Got This! 🔥 Target: 90+ in Maths | 9 March 2026